

Correlativity of the Water Quality Parameters and Sediment Concentration in Green Bay, WI

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Abstract

Located in the northern US and one of the largest freshwater bodies on the earth, Lake Michigan has been suffering from environmental issues during the past decades. Nutrient loadings into Lake Michigan has produced hypoxia, algal bloom, and the most important of all, degraded water quality. Wastewater treatment plants and rivers around the lake are making the most contribution in transporting nutrients into Lake Michigan. Fox River, an important source of nutrient transport into Lake Michigan, introduces a large amount of land-based pollutants into Green Bay (GB). GB is located on the western bank of the Lake and is designated as an area of concern by US Environmental Protection Agency. GB is diagnosed with many environmental problems including hypoxia as a consequence of high concentration of suspended materials and nutrients. Low currents and mixing has turned GB into a nutrient trap that detains about 70% of the total inputs in itself. NEW Water of GB is conducting a monitoring program that includes taking samples and measuring water quality parameters in southern GB and Fox River. There is a record of measurements of water quality parameters, including, chloride (Cl^-), total phosphorous (TP), ortho-phosphorus (O-P), total Kjeldahl nitrogen (TKN), ammonia (NH_3), Chlorophyll-a (Chl-a), turbidity (Tu), total solids (TS), and total suspended solids (TSS) between 2011 and 2013. Suspended sediments can decrease water quality since they can act as attachment sites for more contaminations and toxic pollutants. In this study, we find the correlativity of TS and TSS with other water quality parameters in GB to investigate the relationship between sediment concentration and water quality in the bay. Our results show that TS is correlated with Cl^- , TP, O-P, TKN, NH_3 , Chl-a, and Tu significantly (p -value < 0.001), with correlation coefficients of 0.81, 0.83, 0.67, 0.77, 0.32, 0.64, and 0.81, respectively. The correlations between these water quality parameters and TSS are also significant and correlation coefficients are 0.86, 0.94, 0.65, 0.87, 0.22, 0.84, and 0.97, respectively.

Keywords: Fox River, Green Bay, Hypoxia, Lake Michigan, Nutrients fate and transport, Nutrients loading, Pollutants, Sediment concentration, Suspended solids, Water quality, Wisconsin.